

15. (once amended) An apparatus for determining at least one of motion and location parameters of a railroad locomotive to detect curves and reduce track wear, with the locomotive oriented with either end of the locomotive in the lead in the direction of travel of the locomotive, said apparatus comprising:

at least two phase-locking satellite receivers configured to reference signals received from a set of satellites; and

a processor configured to determine a set of phase differences between the reference signals received by said satellite receivers and an accurate heading of the locomotive using the set of phase differences between the reference signals, wherein the heading represents both the direction of travel of the locomotive and which end of the locomotive is in the lead in the direction of travel of the locomotive.

REMARKS

The Office Action mailed January 15, 2003 has been carefully reviewed and the foregoing amendment has been made in consequence thereof. Submitted herewith is a Submission of Marked Up Claims.

Claims 1-31 are now pending in this application. Claims 1-31 stand rejected.

Applicants note the objections to the drawings. Submitted herewith are formal drawing sheets 1-5. No new matter has been added. For the reasons set forth above, Applicants respectfully request that the objections to the drawings be withdrawn.

The rejection of Claims 1-5, 12-19, and 27-31 under 35 U.S.C. § 103 as being unpatentable over Bruckner (U.S. Pat. No. 6,266,582) in view of Hawthorne (U.S. Pat. No. 6,263,266) is respectfully traversed.

Bruckner describes a global positioning system (GPS) having dual GPS receivers 10 that utilize two antennas (12, 14), one antenna for each channel. The GPS provides coordinate information for the location of each of the antennas, therefore the attitude, and any change thereof, of the aircraft perpendicular to the antenna directional axis 18 may be determined by solving the two-point equation for the line which passes through the antenna coordinates. Determination of the rate of change of the attitude of the aircraft 16 may be determined by evaluation of the change in the coordinate positions of the antennas (12, 14)

with respect to a given time reference which is also provided in the GPS signal. Thus, a dual GPS receivers system utilizing a two antenna installation may provide the same information and functionality of two axis IMUs, which provide information concerning the orientation of the airplane with respect to a reference plane, typically the ground.

Notably, Bruckner does not describe nor suggest determining an accurate heading of a locomotive wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. Applicants respectfully submit that only the nose end of an airplane can be oriented in the lead in the direction of travel of the airplane. Flight is simply not possible with the tail of the plane oriented in the direction of travel of the airplane.

Hawthorne describes a method of optimizing train operation and training in a moving train that includes determining the train's conditions and calculating a desired response to the present conditions of the train to achieve a goal. The method of optimizing train operation includes determining conditions of location, track profile and train forces of the train. A set of preliminary train restraint operating parameters are determined from the determined conditions. Also, a set of preliminary train optimizable operating parameters to minimize train forces, to maximize fuel efficiency and to minimize time to destination is determined.

Notably, Hawthorne does not describe nor suggest an inertial measurement system. Therefore there is no motivation to provide for a redundant inertial measurement system as asserted in the Office Action. Hawthorne, also does not describe nor suggest determining an accurate heading of a locomotive wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive.

Claim 1 recites a method for determining at least one of motion and location parameters of a railroad locomotive, with the locomotive oriented with either end thereof in the lead in the direction of travel of the locomotive wherein the method includes "providing at least two satellite signal receivers on the locomotive at spaced locations along the length of the locomotive...determining a set of phase differences between satellite reference signals received by satellite receivers...determining an accurate heading of the locomotive using the set of phase differences between the satellite reference signals, wherein the heading represents both the direction of travel of the locomotive and which end of the locomotive is in the lead in the direction of travel of the locomotive."

Applicants respectfully submit that the Section 103 rejection of the presently pending claims is not a proper rejection. Obviousness cannot be established by merely suggesting that it would have been an obvious to one of ordinary skill in the art to modify Bruckner according to the teachings of Hawthorne. More specifically, it is respectfully submitted that a prima facie case of obviousness has not been established. As explained by the Federal Circuit, "[i]f proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) MPEP 2143.01. Applicants respectfully submit that flying an aircraft "with either end thereof in the lead in the direction of travel" would render the airplane wholly inoperative for its intended purpose if an attempt were made to fly the plane with the tail end of the plane in the lead, and therefore there is not (and cannot be) any suggestion or motivation to make the proposed modification.

Further, under Section 103, "it is impermissible . . . to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art." In re Wesslau, 147 USPQ 391, 393 (CCPA 1965). Rather, there must be some suggestion, outside of Applicants' disclosure, in the prior art to combine such references, and a reasonable expectation of success must be both found in the prior art, and not based on Applicants' disclosure. In re Vaeck, 20 U.S.P.Q.2d 1436 (Fed. Cir. 1991). In the present case, neither a suggestion nor motivation to combine the cited art, nor any reasonable expectation of success has been shown.

Although it is asserted within the Office Action that Bruckner teach the present invention except for disclosing the vehicle is a locomotive, and that Hawthorne discloses a vehicle that is a locomotive, no motivation nor suggestion to combine the cited art has been shown. Since there is no teaching nor suggestion in the cited art for the claimed combination, the Section 103 rejection appears to be based on a hindsight reconstruction in which isolated disclosures have been picked and chosen in an attempt to deprecate the present invention. Of course, such a combination is impermissible, and for this reason alone, Applicants request that the Section 103 rejection of Claims 1-5, 12-19, and 27-31 be withdrawn.

Furthermore, Applicants respectfully submit that no motivation for the combination can be found within Bruckner and Hawthorne, as Bruckner and Hawthorne teach away from

each other. Bruckner describe, at column 3, lines 5-7, a GPS receiver antenna system that may provide the same information and functionality of two axis inertial measurement units (IMUs) and at column 1, lines 18-20, that IMUs provide information concerning the orientation of the airplane with respect to a reference plane, typically the ground. In addition, Bruckner describes, at column 3, lines 40-44, that using three GPS receivers and three antennas strategically mounted on the aircraft, three dimensional inertial information about three orthogonal axes of the aircraft may be obtained and at column 3, lines 52-53 that relative rotational movement of both antennas 14 and 20 with respect to antenna 12 may provide a combination of roll, pitch and yaw information. Clearly, the three orthogonal axes of the aircraft are roll, pitch and yaw information and not heading information wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. Specifically, Bruckner do not describe nor suggest determining an accurate heading of the locomotive, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive.

In contrast, Hawthorne describes determining a position of a lead locomotive of a train consist using a GPS and does not describe nor suggest determining an accurate heading of the locomotive, wherein the heading represents both the direction of travel of the locomotive and which end of the locomotive is in the lead in the direction of travel of the locomotive. Specifically, at column 10, lines 36-38, Hawthorne describes "a geographical positions system (GPS) which is used to detect the precise latitude and longitude of the head of the train", and at column 5, lines 60-62 that "[p]osition is determined from wheel movement sensors and a Global Positioning System (GPS)."

If art "teaches away" from a claimed invention, such a teaching supports the nonobviousness of the invention. U.S. v. Adams, 148 USPQ 479 (1966); Gillette Co. v. S.C. Johnson & Son, Inc., 16 USPQ2d 1923, 1927 (Fed. Cir. 1990). In light of this standard, it is respectfully submitted that the cited art, as a whole, is not suggestive of the presently claimed invention. More specifically, Applicants respectfully submit that Hawthorne teaches away from Bruckner, and as such, there is no suggestion or motivation to combine Bruckner with Hawthorne.

Further, and to the extent understood, no combination of Bruckner and Hawthorne, describes or suggests the claimed combination, and as such, the presently pending claims are

patentably distinguishable from the cited combination. Specifically, Claim 1 recites a method that includes "determining an accurate heading of the locomotive using the set of phase differences between the satellite reference signals, wherein the heading represents both the direction of travel and which end of the locomotive is in the lead in the direction of travel of the locomotive."

The combination of Bruckner and Hawthorne does not describe nor suggest a method that includes determining an accurate heading of the locomotive using the set of phase differences between the satellite reference signals, wherein the heading represents both the direction of travel and which end of the locomotive is in the lead in the direction of travel of the locomotive. Accordingly, for at least the reasons set forth above, Claim 1 is submitted to be patentable over Bruckner in view of Hawthorne.

Claims 2-5 and 12-14 depend from independent Claim 1. When the recitations of Claims 2-5 and 12-14 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claims 2-5 and 12-14 likewise are patentable over Bruckner in view of Hawthorne.

Claim 15 recites an apparatus for determining at least one of motion and location parameters of a railroad locomotive to detect curves and reduce track wear, with the locomotive oriented with either end of the locomotive in the lead in the direction of travel of the locomotive wherein the apparatus includes "at least two phase-locking satellite receivers configured to reference signals received from a set of satellites...a processor configured to determine a set of phase differences between the reference signals received by said satellite receivers and an accurate heading of the locomotive using the set of phase differences between the reference signals, wherein the heading represents both the direction of travel of the locomotive and which end of the locomotive is in the lead in the direction of travel of the locomotive."

Applicants respectfully submit that the proposed modification would render the prior art invention being so modified unsatisfactory for its intended purpose. Applicants respectfully submit that flying an aircraft "with either end thereof in the lead in the direction of travel" would render the airplane unsatisfactory for its intended purpose therefore there is no suggestion or motivation to make the proposed modification.

Furthermore, the combination of Bruckner and Hawthorne does not describe nor suggest an apparatus for determining at least one of motion and location parameters of a locomotive to detect curves and reduce track wear, with either end of the locomotive in the lead in the direction of travel of the locomotive wherein the apparatus includes at least two phase-locking satellite receivers configured to reference signals received from a set of satellites, a processor configured to determine a set of phase differences between the reference signals received by the satellite receivers and an accurate heading of the locomotive using the set of phase differences between the reference signals, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. Specifically, neither Bruckner nor Hawthorne, alone or in combination describe or suggest a processor configured to determine a set of phase differences between the reference signals received by the satellite receivers and an accurate heading of the locomotive using the set of phase differences between the reference signals, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. Accordingly, for at least the reasons set forth above, Claim 15 is submitted to be patentable over Bruckner in view of Hawthorne.

Claims 16-19, and 27-31 depend from independent Claim 15. When the recitations of Claims 16-19, and 27-31 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claims 16-19, and 27-31 likewise are patentable over Bruckner in view of Hawthorne.

For the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 1-5, 12-19, and 27-31 be withdrawn.

The rejection of Claims 10, 11, and 24-27 under 35 U.S.C. § 103 as being unpatentable over Bruckner in view of Hawthorne and further in view of Kumar (U.S. Pat. No. 5,896,947) is respectfully traversed.

Bruckner and Hawthorne are described above. Kumar describes a method for simultaneously lubricating the rail gage side (RAGS) and wheel flanges ahead of a locomotive's 1 tractive wheels and lubricating the top of the rail (TOR) behind the tractive wheels to reduce the resistance of the trailing cars and reduce the locomotive wheel flange wear. The method includes controlling both lubricating units with the same computer

controller 2 when a single locomotive 1 is used and two controllers 2F, 2R located in two different locomotives 1 in the case of a train consist 10.

Claims 10 and 11 depend, directly or indirectly, from independent Claim 1, which recites a method for determining at least one of motion and location parameters of a locomotive, with either end thereof in the lead in the direction of travel of the locomotive wherein the method includes “providing at least two satellite signal receivers on the locomotive at spaced locations along the length of the locomotive...determining a set of phase differences between satellite reference signals received by satellite receivers...determining an accurate heading of the locomotive using the set of phase differences between the satellite reference signals, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive.”

None of Bruckner, Hawthorne, nor Kumar, considered alone or in combination, describe or suggest a method for determining at least one of motion and location parameters of a locomotive that includes determining an accurate heading of the locomotive using the set of phase differences between the satellite reference signals, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. More specifically, none of Bruckner, Hawthorne, nor Kumar, considered alone or in combination, describe or suggest a method for determining an accurate heading of a locomotive wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. Rather, Bruckner describes a dual GPS receivers system utilizing a two antenna installation that may provide the same information and functionality of two axis IMUs, which provide information concerning the orientation of the airplane with respect to a reference plane, typically the ground, and Hawthorne describes a method of optimizing train operation that includes determining conditions of location, track profile and train forces of the train. Furthermore, Kumar describe a method for simultaneously lubricating the rail gage side (RAGS) and wheel flanges ahead of a locomotive's tractive wheels and lubricating the top of the rail (TOR) behind the locomotive's tractive wheels. For at least the reasons set forth above, Claim 1 is submitted to be patentable over Bruckner in view of Hawthorne, and further in view of Kumar.

Claims 10 and 11 depend, directly or indirectly, from independent Claim 1. When the recitations of Claims 10 and 11 are considered in combination with the recitations of Claim 1, Applicants submit that Claims 10 and 11 likewise are patentable over Bruckner in view of Hawthorne, and further in view of Kumar.

Claims 24-27 depend, directly or indirectly, from independent Claim 15, which recites an apparatus for determining at least one of motion and location parameters of a locomotive to detect curves and reduce track wear, with either end of the locomotive in the lead in the direction of travel of the locomotive wherein the apparatus includes “at least two phase-locking satellite receivers configured to reference signals received from a set of satellites...a processor configured to determine a set of phase differences between the reference signals received by said satellite receivers and an accurate heading of the locomotive using the set of phase differences between the reference signals, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive.”

None of Bruckner, Hawthorne, nor Kumar, considered alone or in combination, describe or suggest an apparatus for determining at least one of motion and location parameters of a locomotive to detect curves and reduce track wear, with either end of the locomotive in the lead in the direction of travel of the locomotive wherein the apparatus includes at least two phase-locking satellite receivers configured to reference signals received from a set of satellites, and a processor configured to determine a set of phase differences between the reference signals received by the satellite receivers and an accurate heading of the locomotive using the set of phase differences between the reference signals, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. More specifically, none of Bruckner, Hawthorne, nor Kumar, considered alone or in combination, describe or suggest a processor configured to determine an accurate heading of the locomotive wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotives. Rather, Bruckner describes a dual GPS receivers system utilizing a two antenna installation that may provide the same information and functionality of two axis IMUs, which provide information concerning the orientation of the airplane with respect to a reference plane, typically the ground, and Hawthorne describes a method of optimizing train operation that includes determining conditions of location, track profile and train forces of the train.

Furthermore, Kumar describe a method for simultaneously lubricating the rail gage side (RAGS) and wheel flanges ahead of a locomotive's tractive wheels and lubricating the top of the rail (TOR) behind the locomotive's tractive wheels. For at least the reasons set forth above, Claim 15 is submitted to be patentable over Bruckner in view of Hawthorne, and further in view of Kumar.

Claims 24-27 depend, directly or indirectly, from independent Claim 15. When the recitations of Claims 24-27 are considered in combination with the recitations of Claim 15, Applicants submit that Claims 24-27 likewise are patentable over Bruckner in view of Hawthorne, and further in view of Kumar.

For the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 10, 11 and 24-27 be withdrawn.

The rejection of Claims 6-9, and 20-23 under 35 U.S.C. § 103 as being unpatentable over Bruckner in view of Hawthorne and further in view of Bidaud (U.S. Pat. No. 6,347,265) is respectfully traversed.

Bruckner and Hawthorne are described above. Bidaud describes a track analyzer included on a vehicle 28 traveling on a track 10 includes a vertical gyroscope 20 for determining a grade and an elevation of the track. A rate gyroscope 50 determines a curvature of the track. A speed determiner 70 determines a speed of the vehicle relative to the track. A distance determiner 91 determines a distance the vehicle has traveled along the track. Also, the direction in which the vehicle 28 is moving, meaning forward or backward, is determined by whether the phase of the first plate 112 leads/lags the phase of the second plate 114.

Claims 6-9 depend, directly or indirectly, from independent Claim 1, which recites a method for determining at least one of motion and location parameters of a locomotive, with either end thereof in the lead in the direction of travel of the locomotive wherein the method includes "providing at least two satellite signal receivers on the locomotive at spaced locations along the length of the locomotive...determining a set of phase differences between satellite reference signals received by satellite receivers...determining an accurate heading of the locomotive using the set of phase differences between the satellite reference signals,

wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive.”

None of Bruckner, Hawthorne, nor Bidaud, considered alone or in combination, describe or suggest a method for determining at least one of motion and location parameters of a locomotive that includes determining an accurate heading of the locomotive using the set of phase differences between the satellite reference signals, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. More specifically, none of Bruckner, Hawthorne, nor Bidaud, considered alone or in combination, describe or suggest a method for determining an accurate heading of a locomotive wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. Rather, Bruckner describes a dual GPS receivers system utilizing a two antenna installation that may provide the same information and functionality of two axis IMUs, which provide information concerning the orientation of the airplane with respect to a reference plane, typically the ground, and Hawthorne describes a method of optimizing train operation that includes determining conditions of location, track profile and train forces of the train. Furthermore, Bidaud describe a track analyzer included on a vehicle traveling on a track for determining a grade and an elevation of the track, a curvature of the track, a speed of the vehicle relative to the track, a distance the vehicle has traveled along the track, and the direction in which the vehicle is moving, either forward or backward. For at least the reasons set forth above, Claim 1 is submitted to be patentable over Bruckner in view of Hawthorne, and further in view of Bidaud.

Claims 6-9 depend, directly or indirectly, from independent Claim 1. When the recitations of Claims 6-9 are considered in combination with the recitations of Claim 1, Applicants submit that Claims 6-9 likewise are patentable over Bruckner in view of Hawthorne, and further in view of Bidaud.

Claims 20-23 depend, directly or indirectly, from independent Claim 15, which recites an apparatus for determining at least one of motion and location parameters of a locomotive to detect curves and reduce track wear, with either end of the locomotive in the lead in the direction of travel of the locomotive wherein the apparatus includes “at least two phase-locking satellite receivers configured to reference signals received from a set of satellites...a processor configured to determine a set of phase differences between the reference signals

received by said satellite receivers and an accurate heading of the locomotive using the set of phase differences between the reference signals, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive.”

None of Bruckner, Hawthorne, nor Bidaud, considered alone or in combination, describe or suggest an apparatus for determining at least one of motion and location parameters of a locomotive to detect curves and reduce track wear, with either end of the locomotive in the lead in the direction of travel of the locomotive wherein the apparatus includes at least two phase-locking satellite receivers configured to reference signals received from a set of satellites, and a processor configured to determine a set of phase differences between the reference signals received by the satellite receivers and an accurate heading of the locomotive using the set of phase differences between the reference signals, wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotive. More specifically, none of Bruckner, Hawthorne, nor Bidaud, considered alone or in combination, describe or suggest a processor configured to determine an accurate heading of the locomotive wherein the heading represents the direction of travel of the locomotive with either end thereof in the lead in the direction of travel of the locomotives. Rather, Bruckner describes a dual GPS receivers system utilizing a two antenna installation that may provide the same information and functionality of two axis IMUs, which provide information concerning the orientation of the airplane with respect to a reference plane, typically the ground, and Hawthorne describes a method of optimizing train operation that includes determining conditions of location, track profile and train forces of the train. Furthermore, Bidaud describe a method for simultaneously lubricating the rail gage side (RAGS) and wheel flanges ahead of a locomotive’s tractive wheels and lubricating the top of the rail (TOR) behind the locomotive’s tractive wheels. For at least the reasons set forth above, Claim 15 is submitted to be patentable over Bruckner in view of Hawthorne, and further in view of Bidaud.

Claims 20-23 depend, directly or indirectly, from independent Claim 15. When the recitations of Claims 20-23 are considered in combination with the recitations of Claim 15, Applicants submit that Claims 20-23 likewise are patentable over Bruckner in view of Hawthorne, and further in view of Bidaud.

For the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 6-9 and 20-23 be withdrawn.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Charles L. Zahm, et al.

Serial No.: 09/585,192

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For: METHODS AND APPARATUS FOR MEASURING
NAVIGATIONAL PARAMETERS OF A LOCOMOTIVE

Art Unit: 3661

Examiner: Brian J. Broadhead

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SUBMISSION OF MARKED-UP CLAIMS

GROUP 3600

Commissioner for Patents
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Sir:

Submitted herewith are marked up Claims in accordance with 37 C.F.R. Section 1.121(c)(1)(ii), with additions underlined and deletions [bracketed].

IN THE CLAIMS

1. (once amended) A method for determining at least one of motion and location parameters of a railroad locomotive, with the locomotive oriented with either end thereof in the lead in the direction of travel of the locomotive, said method comprising the steps of:

providing at least two satellite signal receivers on the locomotive at spaced locations along the length of the locomotive;

determining a set of phase differences between satellite reference signals received by satellite receivers; and

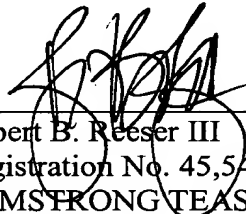
determining an accurate heading of the locomotive using the set of phase differences between the satellite reference signals, wherein the heading represents both the direction of travel of the locomotive and which end of the locomotive is in the lead in the direction of travel of the locomotive.

15. (once amended) An apparatus for determining at least one of motion and location parameters of a railroad locomotive to detect curves and reduce track wear, with the locomotive oriented with either end of the locomotive in the lead in the direction of travel of the locomotive, said apparatus comprising:

at least two phase-locking satellite receivers configured to reference signals received from a set of satellites; and

a processor configured to determine a set of phase differences between the reference signals received by said satellite receivers and an accurate heading of the locomotive using the set of phase differences between the reference signals, wherein the heading represents both the direction of travel of the locomotive and which end of the locomotive is in the lead in the direction of travel of the locomotive.

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